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10/564,249	01/11/2006	Shouichi Miyawaki	1141/75707	8021

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EXAMINER	
VAUGHN, MEGANN E	
ART UNIT	PAPER NUMBER
2859	

SHORTENED STATUTORY PERIOD OF RESPONSE	MAIL DATE	DELIVERY MODE
3 MONTHS	02/08/2007	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

Office Action Summary	Application No.	Applicant(s)	
	10/564,249	MIYAWAKI ET AL.	
	Examiner	Art Unit	
	Megann E. Vaughn	2859	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *11 January 2006*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-18* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-18* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *11 January 2006* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *1/11/2006*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Claim Objections

1. Claims 3, 10, 11, 15 and 16 are objected to because of the following informalities:

Regarding claim 3, said claim recites the limitation "steps (1) – (5)" in line 2; there is insufficient antecedent basis for this limitation because claim 3 is dependent on claim 1, which does not disclose "step (5)."

Regarding claim 10, said claim recites the limitation "steps (6)" in line 3; there is insufficient antecedent basis for this limitation because claim 10 is dependent on claim 9, which is dependent on claim 1, neither of which disclose "step (6)."

Regarding claim 11, said claim recites the limitation "the residual magnetic field response function" on line 6; there is insufficient antecedent basis for this limitation (possible correction could be ---a residual magnetic field response function).

Regarding claim 15, said claim recites the limitation "the superposed correction magnetic field" in line 2; there is insufficient antecedent basis for this limitation.

Regarding claim 16, said claim recites the limitation "the correction coils" in line 2; there is insufficient antecedent basis for this limitation.

Appropriate correction is required.

Claim Rejections - 35 USC § 112

2. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

3. Claims 9-10 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 9 recites the limitation "the above-mentioned chart" in lines 5 and 8-9, as well as, the "value of Y" in lines 4 and 9 and the "value of X" in line 11. There is insufficient antecedent basis for these limitations in the claim, and consequently, it is not possible to determine the subject matter regarded as the invention. Also, it is unknown what chart/drawing/figure the claim is referring to in the specification/drawings, making it impossible to even attempt to interpret the claim in view of the specification/drawings. Therefore, claims 9 and 10 have been withdrawn from further prosecution on the merits.

Claim Rejections - 35 USC § 102

4. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for a patent.
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

5. Claims 1-7,11-15, 17, and 18 are rejected under 35 U.S.C. 102(b) as being anticipated by Miyoshi (US 6559643).

Regarding claim 1, Miyoshi discloses magnetic resonance imaging method comprising: (1) a step for applying one or more pulses of the gradient magnetic field sequentially (column 6, lines 18-20; figure 3, RS1-RS4); (2) a step for calculating the

residual magnetic field being generated in the magnetic device by the gradient magnetic field on the basis of the residual magnetic field response function that represents the relation between the strength of the applied gradient magnetic field and the strength of the residual magnetic field being generated by the applied gradient magnetic field (column 6, lines 18-58; figure 2); and (3) a step for correcting the calculated residual magnetic field (column 6, lines 59-63); (4) wherein the magnetic resonance imaging method includes a step for updating the residual magnetic field response function used in step (2) by making it depend on the application history of the sequentially applied gradient magnetic field (column 6, lines 59-63).

Regarding claim 2, Miyoshi discloses that before the steps (1) - (4) are performed, a step for degaussing/demagnetizing the residual magnetic field being generated in the magnetic device, and for initializing the residual magnetic field response function to the state after degaussing (column 4, line 56- column 5, line 3).

Regarding claim 3, Miyoshi discloses a step for obtaining the residual magnetic field response function after degaussing and for storing it as the calibration data is performed (column 4, line 56- column 5, line 3; column 6, lines 59-67).

Regarding claims 4 and 5, Miyoshi discloses a magnetic resonance imaging method according to claim 1, wherein upon application the correction of the residual magnetic field in step (3) is performed by superposing the correction magnetic field over the gradient magnetic field, wherein the superposed and applied correction magnetic field is the gradient magnetic field that has the same axis as the previously mentioned gradient magnetic field (column 6, lines 65-67; figure 5).

Regarding claim 6, Miyoshi discloses that the superposed and applied correction magnetic field includes components other than the gradient magnetic field that has the same axis as the previously mentioned gradient magnetic field (see figure 5).

Regarding claim 7, Miyoshi discloses that the correction of the residual magnetic field in step (3) is performed by varying the strength of the gradient magnetic field for applying to correct the residual magnetic field of which its strength is previously calculated (column 6, lines 59-67).

Regarding claim 11, Miyoshi discloses in figure 1, a magnetic resonance imaging apparatus comprising, a static magnetic field generation means (1) for generating the static magnetic field in the imaging space where the subject is placed (column 5, lines 34-38); a gradient magnetic field generation means (1g) for applying the gradient magnetic field in the above-mentioned imaging space; and a control means (8) for controlling the application of the gradient magnetic field by the gradient magnetic field generation means (column 5, lines 50-54); wherein the magnetic resonance imaging apparatus comprises a residual magnetic field correction means being connected to the control means, for correcting the residual magnetic field being generated by the application of the gradient magnetic field taking into consideration the application history of the gradient magnetic field (column 6, lines 18-67).

Regarding claim 12, Miyoshi discloses in figure 1 that the residual magnetic field correction means comprises a residual magnetic field correction control means (8) being connected to the control means, for controlling the correction of the residual

magnetic field (column 6, lines 18-67); a storage means (8) being connected to the residual magnetic field correction control means (column 5, lines 50-54), for storing the residual magnetic field response function that depends on the application history of the gradient magnetic field; and a correction magnetic field generation means being connected to the residual magnetic field correction control means, for applying the correction magnetic field to correct the residual magnetic field according to the residual magnetic field correction controlling signals (3) that are inputted from the residual magnetic field correction control means (8).

Regarding claim 13, Miyoshi discloses that the residual magnetic field correction control means performs the controlling of the correction for the residual magnetic field by (9) a step for calculating the strength of the residual magnetic field being generated by the application of the gradient magnetic field according to the residual magnetic field response function being stored in the storage means, upon the transmission of the information from the controlling means about the strength of the gradient magnetic field that is to be applied next (column 6, lines 18-58; figure 2); (10) a step for calculating the strength of the correction magnetic field to correct the residual magnetic field of which its strength is previously calculated (column 6, lines 18-58; figure 2); (11) a step for transmitting the residual magnetic field correction controlling signals for applying the correction magnetic field of previously calculated strength to the correction magnetic field generation means (column 5, lines 50-62); and (12) a step for calculating and updating the variance of the residual magnetic field response function by the application

of the gradient magnetic field, and for storing the updated residual magnetic field response function in the storage means (column 6, lines 55-67).

Regarding claim 14, Miyoshi discloses that the correction magnetic field is the gradient magnetic field that has the same axis as the previously mentioned gradient magnetic field (column 6, lines 65-67; figure 5).

Regarding claim 15, Miyoshi discloses that the superposed and applied correction magnetic field includes components other than the ones of the gradient magnetic field, that have the same axis as the previously mentioned gradient magnetic field (see figure 5).

Regarding claim 17, Miyoshi discloses that the residual magnetic field correction means comprises a gradient magnetic field correction control means (figure 1, 8) that is connected to the control means (column 5, lines 50-62), for controlling the application of the gradient magnetic field by correcting the affect of the residual magnetic field (column 6, lines 59-67); and a storage means (figure 1, 8) that is connected to the gradient magnetic field correction control means, for storing the residual magnetic field response function that depends on the application history of the gradient magnetic field (column 6, lines 59-67), and the gradient magnetic field generation means is connected to the gradient magnetic field correction control means (column 5, lines 50-62).

Regarding claim 18, Miyoshi discloses that the gradient magnetic field correction control means controls the correction of the gradient magnetic field by (13) a step for calculating the strength of the residual magnetic field being generated by the application

of the gradient magnetic field according to the residual magnetic field response function being stored in the storage means, upon the transmission of the information from the controlling means about the strength of the gradient magnetic field that is to be applied next (column 6, lines 18-58); (14) a step for calculating how much of the gradient magnetic field strength is to be varied for applying to correct the residual magnetic field of the calculated strength (column 6, lines 59-67); (15) a step for transmitting the gradient magnetic field correction controlling signals for applying the gradient magnetic field of the varied strength to the gradient magnetic field generation means (column 5, lines 50-62); and (16) a step for calculating and updating the variance of the gradient magnetic field response function by the application of the gradient magnetic field, and for storing the updated residual magnetic field response function to the storage means (column 6, lines 59-67).

Claim Rejections - 35 USC § 103

6. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

7. Claim 8 is rejected under 35 U.S.C. 103(a) as being unpatentable over Miyoshi (US 6559643) in view of Goto (US 6392411).

Regarding claim 8, Miyoshi discloses a magnetic resonance imaging method according to claim 1 as state above in paragraph 5. Miyoshi does not specifically

disclose that the residual magnetic field response function is represented by drawing a residual magnetic field response curve on a two-dimensional chart of which the x-axis indicates the applied gradient magnetic field and the y-axis indicates the residual magnetic field being generated by the application of the gradient magnetic field.

Goto discloses in figures 6-8, charts that represent the relationship/curve between the applied gradient magnetic field (x-axis) and the residual magnetic field (Y-axis) (see figures). Therefore it would have been obvious to a person having ordinary skill in the art at the time that the invention was made to represent the relationship between the applied gradient magnetic field and the residual magnetic field, both disclosed by Miyoshi, on a chart, as taught by Goto, in order to visually show the applied gradient magnetic field/pulse that is necessary to achieve a desired residual magnetic field as taught by Goto (column 7, line 61- column 8, line 24).

8. Claim 16 is rejected under 35 U.S.C. 103(a) as being unpatentable over Miyoshi (US 6559643) in view of Carlini (US 6867590).

Regarding claim 16, Miyoshi discloses a magnetic resonance imaging apparatus according to claim 12 as stated above in paragraph 5. Miyoshi does not disclose that the correction magnetic field generation means is correction coils.

Carlini discloses a method of compensating for gradient induced eddy currents in wherein correction coils are used for compensation purposes (column 7, lines 20-28). Therefore it would have been obvious to a person having ordinary skill in the art at the time that the invention was made for Miyoshi to utilize correction coils, as taught by

Carlini, in order to help correct/compensate the residual magnetic field induced by the gradient magnetic field.

Conclusion

9. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure: **Miyamoto (US 6483305)** discloses a method for reducing residual magnetization caused by gradient pulses, **Goto (US 6392411)** discloses a method to prevent variation in residual magnetization due to a change in gradient magnetic field pulse, **Miyoshi (US 2002/0050816)** discloses a method for restraining residual magnetization, **Heubes (US 2002/0135366)** discloses a multi-echo imaging method by which artifacts as a result of residual magnetizations are reduced, and **Asano et al (US 2003/0160616)** discloses an MRI apparatus for reducing the effect of residual magnetization caused by gradient pulses.

10. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Megann E. Vaughn whose telephone number is 571-272-8927. The examiner can normally be reached on 8 am- 5 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Diego Gutierrez can be reached on 571-272-2245. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

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